ITEM 90 FY92
CEL-DS13
June 22, 1990

PURCHASE DESCRIPTION

SIGNAL GENERATOR 6 GHz to 12 GHz

FSNLA-B

1.0 GENERAL This procurement requires a stable microwave signal generator capable of generating signals over the frequency range of 6 GHz to 12 GHz with internal and external AM, FM, and Pulse modulation with delay capabilities.

2.0 CLASSIFICATION The equipment shall meet the requirements of MIL-T-28800( ), Type III, Class 5, Style E, Color R for Navy shipboard, submarine, and shore applications with the following modifications and exceptions:

a. The relative humidity requirement is limited to 95% non-condensating.

b. The operating and non-operating altitude requirements are not invoked.

c. The Electromagnetic Interference requirements of MIL-T-28800( ) are limited to CE01, CE03, CS01, CS02 (0.05 to 100 MHz), CS06, RE01 (back panel search excluded), RE02 (14 kHz to 1 GHz), and RS03.

d. The warm-up time is extended to one hour.

3.0 OPERATIONAL REQUIREMENTS The equipment shall be capable of generating signals within the parameters and accuracies specified herein.

3.1 Frequency Characteristics

3.1.1 Frequency Range: At least 6 GHz to 12 GHz

3.1.2 Frequency Resolution: Minimum resolution at least 1 kHz; digital readout

3.1.3 Frequency Accuracy: Equal to accuracy of reference standard (CW mode)

3.1.4 Frequency Stability (Equal to or better than limits specified below)
3.1.4.1 Internal: Less than 1 part in $10^9$/hr at 25˚C ±5˚C after one hour warmup
3.1.4.2 External: Equal to external standard frequency stability
3.1.4.3 Temperature: Less than ±2 parts in $10^5$ change over 0 to 50˚C temperature range

3.1.5 Residual Modulation (CW mode in 50 Hz to 15 kHz detection BW)
3.1.5.1 FM: Less than 150 Hz rms
3.1.5.2 AM: Less than 0.15% pk

3.1.6 Spectral Purity
3.1.6.1 Harmonics: < -30 dBc
3.1.6.2 Power line/Fan rotation related harmonics: < -30 dBc (< 1 kHz from carrier)
3.1.6.3 Non-harmonics/Spurious: < -55 dBc (≥ 10 kHz from carrier)
3.1.6.4 Phase Noise: < -75 dBc/Hz at 10 kHz offset from carrier

3.2 Output Characteristics

3.2.1 Range: +10 to -120 dBm (minimum)

3.2.2 RF Output: Leveled output shall be available at +10 dBm or less.

3.2.3 Accuracy: ±2.0 dB for output levels from +10 dBm to -50 dBm; additional 0.1 dB/10 dB step for levels below -50 dBm

3.2.4 Display/Resolution: Digital display; minimum resolution of 0.1 dB

3.2.5 Flatness: ±1.0 dB measured at an output level of +10 dBm

3.2.6 Impedance/Connector: 50 ohms; type-N female connector
3.2.6.1 VSWR: < 2:1 [at levels < 0 dBm]

3.2.7 Reverse Power Protection: The generator shall be capable of accepting the following signal levels at its output connector without resulting damage.
3.2.7.1 Average Power: 5 watts
3.2.7.2 Peak Power: 2 kW [Widths < 10 μsec]

3.3 Modulation Characteristics

3.3.1 Pulse Modulation
3.3.1.1 Internal
3.3.1.1.1 Rate (PRF): At least 50 Hz to 50 kHz
3.3.1.1.2 Width (PW): 0.1 to 10.0 microseconds
3.3.1.1.3 Rise/Fall Times: Less than 50 nanoseconds
3.3.1.1.4 ON/OFF Ratio: Greater than 80 dB
3.3.1.1.5 Delay: At least 50 nanoseconds to 100 milliseconds; accuracy 20% of setting
3.3.1.1.5.1 Sync Pulse Output: TTL compatible; rise time less than 50 nanoseconds
3.3.1.1.5.2 Video Pulse Output: TTL compatible; width corresponds to PW control setting.
3.3.1.1.6 External Trigger Input: TTL compatible; at least 100 Hz to 50 kHz, provides sync rate for pulse modulation
3.3.1.2 External
3.3.1.2.1 Rate (PRF): At least 50 Hz to 50 kHz
3.3.1.2.2 Width (PW): Greater than 0.1 microseconds
3.3.1.2.3 Video Output: TTL compatible pulse; same PW and PRF as external input pulse
3.3.1.2.4 Pulse Input: TTL compatible

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| 3.3.2 | Amplitude Modulation (AM) [Level ≤ 0 dBm] | |
| 3.3.2.1 | Internal AM | |
| 3.3.2.1.1 | Rate: At least 400 Hz and 1 kHz | |
| 3.3.2.1.2 | Depth: 0 to 90% minimum | |
| 3.3.2.1.3 | Accuracy: ±10% of setting | [50% depth @ 1 kHz] |
| 3.3.2.1.4 | Distortion: ≤ 5% | [50% depth @ 1 kHz] |
| 3.3.2.1.5 | Incidental FM: ≤ 200 Hz rms (0.05 - 15 kHz BW) | [50% depth @ 1 kHz] |
| 3.3.2.1.6 | Residual AM (AM mode): ≤ 0.2% pk (0.05 - 15 kHz BW) | [0.0% depth @ 1 kHz] |
| 3.3.2.2 | External AM | |
| 3.3.2.2.1 | Rates: At least 10 Hz to 20 kHz | |
| 3.3.2.2.2 | Depth: 0 to 90% minimum | |
| 3.3.2.2.3 | Distortion: ≤ 5% | [50% depth @ 1 kHz] |

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|---|---|---|
| 3.3.3 | Frequency Modulation (FM) {F = carrier freq / ΔF = peak freq deviation} | |
| 3.3.3.1 | Internal FM | |
| 3.3.3.1.1 | Rate: At least 400 Hz and 1 kHz | |
| 3.3.3.1.2 | FM Deviation: 0 to at least 1 MHz peak | |
| 3.3.3.1.3 | FM Accuracy: ±10% | |
| 3.3.3.1.4 | Incidental AM: ≤ 0.2% (50 Hz - 15 kHz BW) | [ΔF = 20 kHz @ 1 kHz] |
| 3.3.3.1.5 | Residual FM (FM mode): ≤ 500 Hz rms (0.05 - 15 kHz BW) | [ΔF = 0.0 kHz @ 1 kHz] |
| 3.3.3.2 | External FM | |
| 3.3.3.2.1 | Rates: At least 20 Hz to 100 kHz | |
| 3.3.3.2.2 | FM Deviation: 0 to at least 1 MHz peak | |
| 3.3.3.2.3 | FM Accuracy: ±10% | [ΔF ≥ 10 kHz] |
| 3.3.3.2.4 | Distortion: ≤ 5% | [ΔF = 300 kHz @ 50 kHz] |

## 4.0 GENERAL REQUIREMENTS

4.1 Power Source: 115 and 230 Vac ±10%, single phase, at line frequencies of 50, 60, and 400 Hz within ±10%, 250 VA maximum

4.2 Dimensions: The total volume shall not exceed 46,000 $cm^3$ (2,800 $in^3$).

4.3 Weight: The overall weight shall not exceed 34.1 kg (75 lbs).

4.4 Calibration Interval: The calibration interval shall be 12 months minimum. The equipment shall be within all accuracy requirements specified herein, with a 72% or greater confidence factor following a calibration interval of 12 months.

4.5 Remote Operation: The unit will be capable of remote operation via IEEE-488( ) bus interface. It shall operate as a talker or listener such that all functions except the power on/off switch are controllable and shall have as a minimum the following subset of GPIB commands: AH1, SH1, T6, L4, SR1, RL1, DC1, DT1.

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